CONTENTS

SEPTEMBER 1993 VOLUME 125 NUMBER 1

Tansley Review No. 51.

Gene expression under temperature stress. By CATHERINE HOWARTH AND HELEN J. OUGHAM 1

Tansley Review No. 52.

The role of active oxygen in the response of plants to water deficit and disiccation. By NICHOLAS SMIRNOFF 27

The role of crassulacean acidmetabolism (CAM) in the adaptation of plants to salinity. By ULRICH LÜTTGE 59

Flooding resistance and shoot elongation in relation to developmental stage and enrivonmental conditions in *Rumex maritimus* L. and *Rumex palustris* Sm. By A. J. M. VAN DER SMAN, C. W. P. M. BLOM AND G. W. M. BARENDSE 73

H^+ exchange and nutrient uptake by roots of the emergent hydrophytes, *Cyperus involucratus* Rottb., *Eleocharis sphacelata* R. Br. and *Juncus ingens* N. A. Wakef. By BRIAN K. SORRELL AND PHILIP T. ORR 85

Xylem development in relation to water uptake by roots of grapevine (*Vitis vinifera* L.). By E. MAPFUMO, D. ASPINALL, T. HANCOCK AND M. SEDGLEY 93

Photosynthesis and nutrient supply in needles of Sitka spruce [*Picea sitchensis* (Bong.) Carr.]. By J. W. CHANDLER AND J. E. DALE 101

Nitrogen uptake, partitioning and internal cycling in *Picea sitchensis* (Bong.) Carr. as influenced by nitrogen supply. By P. MILLARD AND M. F. PROE 113

Modification of the Fe protein of the nitrogenase of *Gloeothece* (Nägeli) sp. ATCC 27152 during growth under alternating light and darkness. By CAIGAN DU AND JOHN R. GALLON 121

Influence of the host on three sub-Arctic annual facultative root hemiparasites. I. Growth, mineral accumulation and above-ground dry-matter partitioning. By W. E. SEEL AND M. C. PRESS 131

The effect of fungicides on vesicular–arbuscular mycorrhizal symbiosis. I. The effects on vesicular–arbuscular mycorrhizal fungi and plant growth. By N. SUKARNO, S. E. SMITH AND E. S. SCOTT 139

Successional patterns of fungal communities in needles of European Silver fir (*Abies alba* Mill.). By FRANCESCA SIEBER-CANAVESI AND T. N. SIEBER 149

CO_2 fluxes of cryptogamic crusts. I. Response to resaturation. By D. L. JEFFRIES, S. O. LINK AND J. M. KLOPATEK 163

A detailed early postglacial (Flandrian) pollen diagram from Cwm. Idwal, North Wales. By RICHARD TIPPING 175

Tephra-dated lowland landscape history of the north of Ireland, A.D. 750–1150. By V. A. HALL, J. R. PILCHER AND F. G. MCCORMAC 193

Altitudinal variation in the response of the vegetation to Late-glacial climatic events in the northern French Alps. By FERNAND DAVID 203

REVIEWS 221

OCTOBER 1993 VOLUME 125 NUMBER 2

Tansley Review No. 53.

Cells and tissues in the vegetative sporophytes of early land plants. By DIANNE EDWARDS 225

Tansley Review No. 54.

Plant response to irrigation with water enriched with carbon dioxide. By H. Z. Enoch and J. M. Olesen 249

Tansley Review No. 55.

Structure and expression of genes coding for structural proteins of the plant cell wall. By Matilde José and Pere Puigdomènech 259

Tansley Review No. 56.

The deposition of atmospheric ammonia and its effects on plants. By John Pearson and George R. Stewart 283

Tansley Review No. 57.

The control of exocytosis in plant cells. By Nicholas H. Battey and Hugh D. Blackbourn 307

Cloning symbiosis-related cDNAs from eucalypt ectomycorrhiza by PCR-assisted differential screening. By D. Tagu, M. Python, C. Crétin and F. Martin 339

Adverse effects of nitrate on stem modules of *Sesbania rostrata* Brem. By Duck-Kee Kwon and Harry Beevers 345

Uptake and assimilation of nitrite in the acidophilic red alga *Cyanidium caldarium* Geitler. By Amodio Fuggi 351

Immunocytochemical localization of Fe-SOD in different cells of *Anabaena cylindrica* Lemm. grown at two different photon irradiances. By M. Grilli Caiola and Antonella Canini 361

Visualizing the distribution of elements within barley leaves by energy dispersive X-ray image maps (EDX maps). By M. L. Williams, B. J. Thomas, J. F. Farrar and C. J. Pollock 367

A comparison of sensitivity to ozone in seedlings and trees of *Quercus rubra* L. By L. J. Samuelson and G. S. Edwards 373

Long-term effects of drought on photosynthesis of adult oak trees [*Quercus petraea* (Matt.) Liebl. and *Quercus robur* L.] in a natural stand. By Daniel Epron and Erwin Dreyer 381

CO_2 fluxes of cryptogamic crusts. II. Response to dehydration. By D. L. Jeffries, S. O. Link and J. M. Klopatek 391

Desiccation as the active principle in heat-stimulated seed germination of *Leucospermum* R. Br. (Proteaceae) in fynbos. By G. J. Brits, F. J. Calitz, N. A. C. Brown and J. C. Manning 397

Resistance of cowpea [*Vigna unguiculata* (L.) Walp.] to *Striga gesnerioides* (Willd.) Vatke, a parasitic angiosperm. By J. A. Lane, J. A. Bailey, R. C. Butler and P. J. Terry 405

The epidermal surface of the maize root tip. I. Development in normal roots. By R. M. Abeysekera and M. E. McCully 413

Reviews 431

NOVEMBER 1993 VOLUME 125 NUMBER 3

The Tansley Fund of *The New Phytologist* Trust 433

Tansley Review No. 58.

Plasmodesmata and the supracellular nature of plants. By William J. Lucas, Biao Ding and Chris Van Der Schoot 435

Tansley Review No. 59.

Leaf boundary layers. By P. H. Schuepp 477

Microtubule organization and cell morphogenesis in two semi-lobed cell types of *Adiantum capillus-veneris* L. leaflets. By E. Panteris, P. Apostolakos and B. Galatis 509

Ion distribution in relation to leaf age in *Leptochloa fusca* (L.) Kunth (Kallar grass). II. Anions. By Sabine Klagges, A. Saeed Bhatti, G. Sarwar, Andrea Hilpert and W. Dieter Jeschke 521

Nutrient concentrations of foliage and soil in South-western Australia. By W. Foulds 529

Nickel and zinc tolerance and co-tolerance in populations of *Deschampsia cespitosa* (L.) Beauv. subject to artificial selection. By BEATRIX A. K. VON FRENCKELL-INSAM AND THOMAS C. HUTCHINSON 547

Occurrence of heavy metal tolerance and co-tolerance in *Deschampsia cespitosa* (L.) Beauv. from European and Canadian populations. By BEATRIX A. K. VON FRENCKELL-INSAM AND THOMAS C. HUTCHINSON 555

Root porosites and radial oxygen losses of *Rumex* and *Plantago* species as influenced by soil pore diameter and soil aeration. By W. H. M. H. G. ENGELAAR, M. W. VAN BRUGGEN, W. P. M. VAN DEN HOEK, M. A. H. HUYSER AND C. W. P. BLOM 565

The demography of fine roots in response to patches of water and nitrogen. By KURT S. PREGITZER, RONALD L. HENDRICK AND ROBERT FOGEL 575

The susceptibility of roots to infection by an arbuscular mycorrhizal fungus in relation to age and phosphorus supply. By F. AMIJEE, D. P. STRIBLEY AND P. W. LANE 581

Differential hyphal morphogenesis in arbuscular mycorrhizal fungi during pre-infection stages. By M. GIOVANNETTI, C. SBRANA, L. AVIO, A. S. CITERNESI AND C. LOGI 587

Research on mycorrhizas: trends in the past 40 years as expressed in the 'MYCOLIT' database. By JOHN N. KLIRONOMOS AND W. BRYCE KENDRICK 595

Sugar uptake by protoplasts of the ectomycorrhizal fungus, *Amanita muscaria* (L. ex fr.) Hokker. By XIAO-YA CHEN AND RÜDIGER HAMPP 601

Carbohydrates and water status in wheat plants under water stress. By A. KAMELI AND D. M. LÖSEL 609

Growth and stomatal responses of birch (*Betula pendula* Roth.) clones to ozone in open-air and chamber fumigations. By E. PÄÄKKÖNEN, S. PAASISALO, T. HOLOPAINEN AND L. KÄRENLAMPI 615

Functional aspects of secondary carotenoids in *Haematococcus lacustris* (Girod) Rostafinski (Volvocales). I. The accumulation period as an active metabolic process. By C. HAGEN, W. BRAUNE, E. BIRCKNER AND J. NÜSKE 625

Seed rain quantity and quality, 1984–1992, in a high altitude old-growth spruce forest, northern Sweden. By ANNIKA HOFGAARD 635

Ecophysiological responses of plants to global environmental change since the Last Glacial Maximum. By D. J. BEERLING AND F. I. WOODWARD 641

REVIEWS 649

DECEMBER 1993 VOLUME 125 NUMBER 4

Tansley Review No. 60.

Developmental biology of lichens. By ROSMARIE HONEGGER 659

Tansley Review No. 61.

Male gametes and fertilization in angiosperms. By R. B. KNOX, S. Y. ZEE, C. BLOMSTEDT AND M. B. SINGH 679

Immobilization of pectin, xyloglucan and other soluble plant polysaccharides on blotting membranes. By CHRISTOPHER E. JEFFREE 695

Growth and photosynthetic acclimation by *Ranunculus aquatilis* L. in response to inorganic carbon availability. By TOM VINDÆK MADSEN 707

Relations between carbon and nitrogen during growth of *Nannochloropsis oculata* (Droop) Hibberd under continuous illumination. By K. J. FLYNN, K. DAVIDSON AND A. CUNNINGHAM 717

Differences in photosynthetic performance between cyanobacterial and green algal components of lichen photosymbiodemes measured in the field. By T. G. A. GREEN, B. BÜDEL, U. HEBER, A. MEYER, H. ZELLNER AND O. L. LANGE 723

Sites of entry of water into the symplast of maize roots. By G. T. VARNEY, M. E. MCCULLY AND M. J. CANNY 733

A simple method for locating the start of symplastic water flow (flumes) in leaves. By N. A. O'Dowd and M. J. Canny 743

Humidity and light affect the growth, development and nitrogenase activity of stem nodules of *Sesbania rostrata* Brem. By Richard Parsons, Janet I. Sprent and John A. Raven 749

Specificity of the *Rhizobium*–legume symbiosis obtained after mutagenesis in pea (*Pisum sativum* L.). By M. Sagan, A. Messager and G. Duc 755

Concentrations of indole-3-acetic acid in plants of tolerant and susceptible varieties of Chinese cabbage infected with *Plasmodiophora brassicae* Woron. By Jutta Ludwig-Müller, Ulrike Bendel, Petra Thermann, Manfred Ruppel, Ephraim Epstein and Willy Hilgenberg 763

Apoplastic antioxidants as decisive elimination factors within the uptake process of nitrogen dioxide into leaf tissues. By P. Ramge, F.-W. Badeck, M. Plöchl and G. H. Kohlmaier 771

Environmental influences on the development of spruce needle cuticles. By J. N. Cape and K. E. Percy 787

The epidermal surface of the maize root tip. II. Abnormalities in a mutant which grows crookedly through soil. By R. M. Abeysekera and M. E. McCully 801

Differentiation of abnormal sieve elements in roots of wheat (*Triticum aestivum* L.) affected by colchicine. By E. P. Eleftheriou 813

Growth analyses on *in vitro*, *ex vitro* and auxin-rooted hypocotyl cuttings of *Pinus contorta* Dougl. ex Loud. By Roland Grönroos, Gunnar Flygh, Monika Kähr and Sara Von Arnold 829

Effects of cadmium on non-mycorrhizal and mycorrhizal Norway spruce seedlings [*Picea abies* (L.) Karst.] and its ectomycorrhizal fungus *Laccaria laccata* (Scop. ex Fr.) Bk. & Br.: Sulphate reduction, thiols and distribution of the heavy metal. By Ulrich Galli, Martin Meier and Christian Brunold 837

The distribution of arbuscular mycorrhizas in the British flora. By H. J. Peat and A. H. Fitter 845

Contrasting effects of elevated CO_2 on the root and shoot growth of four native herbs commonly found in chalk grassland. By Rachel Ferris and Gail Taylor 855

A pre-Late Devensian pollen site from Camp Fauld, Buchan, north-east Scotland. By Graeme Whittington, Adrian M. Hall and Jack Jarvis 867

Reviews 875